tested with printed letters, with the result of finding that the sharpness of vision follows in its decline essentially the same curve as the discriminative sensibility, but declines a little more slowly at first and a little more rapidly at last. The experiments on the third and fourth points coincide with the usual results, namely, that the limits of vision for green and red are first contracted, then those for yellow and blue; and the colors are finally lost in the same order, while the field for white remains uncontracted even with very considerable darkening. When the eye is stimulated from a source of light between itself and the object upon which it is fixed (condition *b*), it is found that when the extra stimulation increases in intensity, the discriminative sensibility declines more rapidly than the sharpness of vision, and that the disturbance of vision increases as the illumination of the fixated object is reduced, showing the eye thus stimulated to be delicately hemeralopic. Under such extra stimulation the visual field for white is concentrically contracted, the contraction depending in its amount, while the extra stimulus is constant, on the illumination of the object. The colors have their fields contracted and disappear in the order of their brightness, though this is not that of the extent of their fields in normal vision; blue, which then has next to white the widest field of all, may, under the influence of the extra stimulation, disappear, while all the other colors, except violet, are still to be seen. The results for the eye after stimulation (condition *c*) agree with those just given for condition *b*, except that with daylight illumination of the object fixated, colored vision is introduced (especially red-seeing and green-seeing), which brightens one color to the disadvantage of its contrasting color. For the diseases of vision with which the above conditions are comparable, as for the details of the apparatus and methods used in the experiments, the article itself should be consulted.

Die Umkehrung des Sehens und des Gesehenen mit Beziehung auf die gleichzeitige Seh-Abprägung. Prof. HOPPE. Pflüger's Archiv, XLIII, 1888, p. 295.

The "conversion of relief" in plane drawings, as in that which appears to be a half-open book, now seen from behind and now from in front, or like the Schroeder stair figure, has generally been explained as due to a change of conception in the mind of the observer, or to that helped out by ocular motion. Prof. Hoppe finds an additional factor in differences of the impression (*Abprägung*) of the image on the *macula lutea*. He presses the nativistic argument so far as to suggest that the *macula lutea*, in a certain way and to a certain degree, *knows* its own images. For proofs of his position the article itself must be consulted.

On Wundt's Theory of Psychic Synthesis in Vision. J. H. HYSLOP, Ph. D. Mind, XIII, p. 499, Oct. 1888.

After a preliminary explanation of the apparent location of stereoscopic images, Dr. Hyslop quotes Wundt's theory of psychic synthesis with qualified approval, and gives several interesting experiments (for the most part given in his letters to *Science* in the early part of this year) that in a measure confirm that theory. He finds in it, however, a confusion of two conceptions of innervation; the first

making innervation very closely associated with actual muscular contraction and the discharge of nervous energy, the second being little more than the volitional impulse. The author's chief criticism is directed against the first conception. He points out complications into which the theory is driven when it tries to show why innervation of the internal and external recti for different degrees of convergence should give the notion of differences of distance in the third dimension, while that of the other ocular muscles, or even of the recti themselves for parallel motion, gives nothing of the kind. The difficulty of accounting by this theory for the localization at the same time of a pair of homonymous and a pair of heteronymous images is also urged. Since their place depends on innervation, there would have to be innervation at the same time and of the same muscles for different distances. Moreover, it can be shown by experiment that localization may vary with attention, while the position of the eyes and, presumably, the innervation that controls them, remains the same. Against the other form of the theory is urged that it makes a useless distinction of central and peripheral sensations in distinguishing those of innervation from others when all are really central.

Geschmacksprüfungen. KARL RITTMEYER. pp. 28. Göttingen Diss. 1885.

After reviewing the various opinions regarding the portions of the mouth cavity capable of perceiving taste, Rittmeyer made an independent investigation, thoroughly cleansing the tongue after each test, and avoiding contact with the edges of the tongue. He experimented upon ten persons, and found in every case a sensibility to taste outside the tongue—properly and especially (if not exclusively) upon two regions, a portion of the soft palate and the arcus glossopalatinus. Denoting a very pronounced taste sensibility by 1, a minimum sensibility by 4, and with 2 and 3 intermediate, the results for the four cardinal tastes in the average of ten persons were as follows:

For *sweet*, in nine cases the root of the tongue was 1, the edge 2, the tip 3, the soft palate 3-4, the arcus glossopalatinus 4. In one case the tip was 1, the edge 2, and the root 3.

For *salt*, in five cases the result was precisely the same as for the nine cases with sweet; of the remaining five cases, two differed merely in marking the soft palate 4 instead of 3-4, two differed by conforming to the exceptional instance with sweet, and one differed by marking the tip 4 and the soft palate 3.

For *sour*, the root of the tongue is marked 1 twice, 2 three times, 3 four times, and 4 once. The edge is marked 1 seven times and 2 three times. The tip is marked 1 once, 2 four times, 3 four times, and 4 once. The soft palate, 3 twice, 3-4 once, 4 seven times. The arcus glossopalatinus, 3-4 once, 4 nine times.

For *bitter*, the root is marked 1 nine times and 2 once. The edge, 2 nine times and 3 once. The tip 1 once and 4 nine times; the soft palate, 2-3 ten times. The arcus glossopalatinus, the same. This would make the root of the tongue best for sweet and bitter, the edge best for sour. Besides minor variations, one of the ten individuals shows a decidedly different distribution of sensibility from the other nine.